

Basis for the Amendments to the Specification.

The USPTO objected to language within the specification as being unclear. The amendments to the specification overcome these objections without adding any new subject matter.

DISCUSSION

Election/Restriction

Applicants thank the Examiner for withdrawing the Restriction Requirement with regard to all claims of the application, thereby resulting in Claims 16 - 28 and 35 - 63 being pending and presented for examination.

Priority

The USPTO asserted that the Applicant has not filed a certified copy of the priority application. The certified copy of the priority document is being provided by Express Mail under Express Mail No. EQ 880687035 US under separate cover and sent to the USPTO this same date.

Information Disclosure Statement

Applicants also acknowledge consideration by the Examiner of the Information Disclosure Statement that was submitted on April 26, 2006 (listed as being submitted on May 1, 2006).

Specification

Applicants have amended the specification to overcome the objections of the USPTO in paragraph 4 of the Office Action.

Claim Objections

Applicants have amended Claim 49 to overcome the objection to that claim.

Claim rejections under 35 USC §112

Applicants have amended the claims that were rejected under 35 USC §112 in paragraphs 6 - 11 and therefore believe that they have overcome all such bases for rejection.

Claim rejections under 35 USC §103

The USPTO rejected Claims 16 - 19 and 21 - 23 under 35 USC §103 as being unpatentable over Katovic, et al. in view of Rosinski, et al. (U.S. Patent No. 3,832,449) and Kuhl (U.S. Patent No. 4,552,739). In addition, it appears that the USPTO also rejected Claims 24 - 28, 35 - 48 and 50 - 56 based on these same references. The USPTO also rejected Claims 20 and 49 as being unpatentable over Katovic, et al., Rosinski, et al. and Kuhl and further in view of Sumitani, et al. (U.S. Patent No. 4,557,919). Finally, the USPTO rejected Claim 52 as being unpatentable over Katovic, et al., Rosinski, et al. and Kuhl and further in view of Monque, et al. (U.S. Patent No. 5,576,256). Applicants respectfully traverse each of these rejections.

The Invention

Applicants developed a process for the production of a new zeolite of the ZSM-12 type, which is particularly useful for a number of reactions with organic materials, including specifically hydroisomerization of higher paraffins. It was discovered that when the claimed process is used for the synthesis of the novel ZSM-12 zeolite, advantageous properties of the zeolite are exhibited. This novel process comprises a) preparing a synthesis gel in an aqueous solution or suspension comprising 1) an aluminium source, 2) a silicon source, comprising a precipitated silica having a BET surface area less than or equal to 200 m²/g, 3) TEA⁺ as the template, 4) an alkali metal or alkaline earth metal ion source M having a valency of n, and 5) wherein the molar H₂O:SiO₂ ratio of the gel is within the range from 5 to 15; b) crystallizing the synthesis gel under hydrothermal conditions while being stirred, so as to obtain a solid; and c) removing the solid from the solution in order to obtain the ZSM-12 zeolite, wherein the ZSM-12 zeolite has a primary crystal size less than or equal to 0.1 μm; and a specific volume, determined by mercury porosimetry at a maximum pressure of 4,000 bar, of 30 to 200 mm³/g in a pore radius range of 4-10 nm.

The primary reference cited by the USPTO is Katovic, et al. which disclose a method of synthesizing ZSM-12 zeolites. There are several distinctions between the process disclosed in Katovic, et al. and those of the process, as claimed. Several of these distinctions were acknowledged by the USPTO in paragraph 15, page 6 of the Office Action.

Specifically, Katovic, et al. teach a $\text{H}_2\text{O}:\text{SiO}_2$ molar ratio of 20. (See Abstract and Table 1.) In contrast, the $\text{H}_2\text{O}:\text{SiO}_2$ molar ratio of the process, as claimed, is from 5 to 15. To emphasize the distinction between zeolites formed using processes where the $\text{H}_2\text{O}:\text{SiO}_2$ ratios of the gel were 20 or greater and zeolites formed from the process of the invention, Applicants filed comparative test results with the EPO during processing of the corresponding PCT Application, a copy of which is attached as Exhibit A. They showed that zeolites formed using the process of the invention, but with the ratio of $\text{H}_2\text{O}:\text{SiO}_2$ at 20:1 or higher, were not ZSM-12 zeolites but rather MFI zeolites. If desired, Applicants will present this comparative test data in the form of an affidavit.

In addition, Katovic, et al. fail to teach the stirring of the mixture during the crystallization process, a required element of the claims.

Further, Katovic, et al. are silent as to of the BET surface area of the silica used or the physical characteristics the produced ZSM-12 zeolite, which are specifically claimed by Applicants.

To overcome the deficiency in molar ratio of $H_2O:SiO_2$ in Katovic, et al., the USPTO cited Rosinski, et al. Rosinski, et al. disclosed a method for producing ZSM-12 zeolites. In one example, Example IV, a process was disclosed for producing a ZSM zeolite with a molar $H_2O:SiO_2$ ratio of about 13.5. However, the process of Rosinski, et al. was different from Applicants' process, and also the process of Katovic, et al., as Rosinski, et al. teach that colloidal silica is the silica source. (See Example IV, Col. 11, line 16 as well as all other Examples.) In contrast, Katovic, et al. and the Application teach that the form of silica that must be use for production of a ZSM-12 zeolite is "precipitated silica". "On the contrary, by using precipitated silica the co-crystallization of ZSM-5 and ZSM-12 zeolites was not observed (Samples 2 and 4.)" Katovic, et al., page 969.

This distinction between the use of colloidal silica and precipitated silica was important to Applicants. The particular type of silica chosen when using Applicants' process produced distinctively different zeolite products. In the Application,

Inventive Examples 1 and 9 used "precipitated silica" while "Comparative Example 5" used "colloidal silica". The zeolite product produced in Comparative Example 5, using colloidal instead of precipitated silica, contained 30% ZSM-5, instead of ZSM-12, as a by-product. (See Example 5.) In addition, the physical characteristics of the zeolites produced by Inventive Examples 1 and 9 vs. Comparative Example 9 were quite distinctive, as shown in Table 5 on page 28 of the Application.

Thus, a person skilled in the art would not combine the process of Katovic, et al. with that of Rosinski, et al. as the choice of the type of silica is exactly opposite, i.e. one teaches using the use of "colloidal silica" (Rosinski, et al.), while the other states that only "precipitated silica" should be used (Katovic, et al.).

The obviousness rational addressed in KSR was premised on combining elements known in the prior art. However, as stated in Ex Parte Whelan, 89 USPQ 2d 1078, 1084:

The KSR Court noted that obviousness can not be proven merely by showing that the elements of a claimed device were known in the prior art; it must be shown that those of ordinary skill in the art would have had "apparent reason to combine the known elements in the fashioned claim."

There is clearly no reason to combine Katovic, et al. with Rosinski, et al. as each teach exactly opposite processes for the production of ZSM-12.

To further distinguish the composition, as claimed from the cited references, Applicants have amended the claims to introduce a limitation of a BET surface area of the silica source of less than or equal to $200 \text{ m}^2/\text{g}$. This limitation is not disclosed by any of the references, including Katovic, et al. and Rosinski, et al.

The teachings of Kuhl do not overcome the deficiencies in Katovic, et al. and Rosinski, et al. or add to their teachings, as Kuhl was merely cited to disclose that the reaction mixture may be either static or stirred. (Page 6 of Office Action.)

It is not necessary to discuss the teaching of Monque, et al. as this reference was cited merely to state that a catalyst using a ZSM-12 zeolite could be used for a hydroisomerization process.

Finally, it is also not necessary to discuss the teachings of Sumitani, et al., as Sumitani, et al. was cited merely to disclose a process for producing ZSM-12 zeolites utilizing washing with pure water until the ion conductivity of the wash water is less than $50 \text{ }\mu\text{S}/\text{cm}$. (See paragraph 16, page 11 of the Office Action.) Neither of these references overcome the deficiencies in the disclosures of the combination of Katovic, et al., Rosinski, et al. and Kuhl.

Accordingly, none of the references teach each of the unique elements of the inventive process for producing a zeolite of the ZSM-12 type, as claimed by Applicants. In fact, the teachings of the primary references, Katovic, et al. and Rosinski, et al. are in an irreconcilable conflict as to an important process step. In cases in which the prior art teaches away from a chemical composition recited in the claims, obviousness can not be proved merely by showing that each of the elements, as claimed, is present. See Ex Parte Whelan, id.

Because of these distinctions in the teachings of the cited references, a person skilled in the art would not know which features of the processes of the various cited references should be combined. What should be the molar $H_2O:SiO_2$ ratio when the references are in conflict? What should be the type of silica used to form the gel? What should be the BET surface area of the silica source when it is not taught by any of the references? It can not be asserted that the properties of the combined references would be the same as is claimed when a person skilled in the art does not know what process steps to use.

CONCLUSION

Applicants respectfully assert that all bases for rejection of the claims of the Application have been overcome and request the issuance of a Notice of Allowability. If there are any questions, please contact Applicants' counsel.

Respectfully Submitted,



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DATE: Dec 22, 2009

CERTIFICATE OF EFS SUBMISSION (37 C.F.R. § 1.8(a)(1)(C))

I hereby certify that, on the date shown below, this correspondence is being submitted to the Patent and Trademark Office via the Office Electronic Filing System in accordance with § 1.6(a)(4).

Date: December 22, 2009

Nolly Hart
Signature

EXHIBIT A

1. Vergleichsbeispiel A (EX COMP1)

Recipe, Gel Preparation, Synthesis and Characterisation of EX COMP1 (40 l Batch)

Raw Materials	Amount / g	Supplier
Precipitated silica (FK 320)	5210.2	Degussa
Al(OH) ₃	120.2	ALCOA
TEABr (98 wt.-%)	3287.8	SACHEM
NaOH	628.8	
H ₂ O	24753.0+2000.0 (rinse H ₂ O)	

Gel composition:

20,00 H₂O : SiO₂ : 0,010 Al₂O₃ : 0,100 Na₂O : 0,200 TEABr

Synthesis conditions:

Crystalliser / l	40
Heating rate	to 140°C within 12 h
Synthesis time / h	131
Synthesis pressure	up to 9 bar
Stirring / rpm	54
Stirrer	Anchor

Characterisation: The XRD-spectra of the solid product indicates an MFI zeolite, which was not further examined.

2. Vergleichsexperiment B (EX COMP2)

Recipe, Gel Preparation and Synthesis of EX COMP2

(40 I Batch)

Raw Materials	Amount/g	Supplier
Ludox HS-40	8379.9	Du Pont
Na- Aluminate	100.6	Giulini
TEAOH (35 wt.-%)	3519.6	SACHEM
H ₂ O	24000	

Gel composition: 31,13 H₂O: SiO₂:0,0099 Al₂O₃:0,0222 Na₂O:0,1499
TEAOH.

Synthesis conditions:

Crystalliser/l	40
Heating rate	to 165°C within 12 h
Synthesis time/h	228
Synthesis pressure/bar	10 to 11
Stirring/rpm	73
Stirrer	Anchor

Filtration, Drying and Calcination of EX COMP2

After 228 h crystallisation time the crystalliser was cooled down to room temperature. The product was filtered and washed with demineralised water over a Schenk membrane filter press until the wash water has a conductivity of less than 100 µS/cm. The filter cake was dried at 120°C for 16 h (EX COMP2 washed & dried; yield: 2.89 kg) and calcined at 550°C in an atmosphere of air for 5 h.

Chemical and Physical Characterisation of EX COMP2

The chemical characterisation data are given for the uncalcined sample EX COMP2 washed & dried:

LOI _{1000°C} (wt.-%)	9.0
Si (wt.-%) ^{a)}	46.26
Al (wt.-%) ^{a)}	0.87
Na (wt.-%) ^{a)}	0.167
C (wt.-%) ^{a)}	6.69
n(SiO ₂)/n(Al ₂ O ₃)	102

^{a)}: based on LOI_{1000°C}

The XRD exhibit pure MFI.

The SEM-pictures show large elongated crystals (length up to 10 μm).